FIG. 1

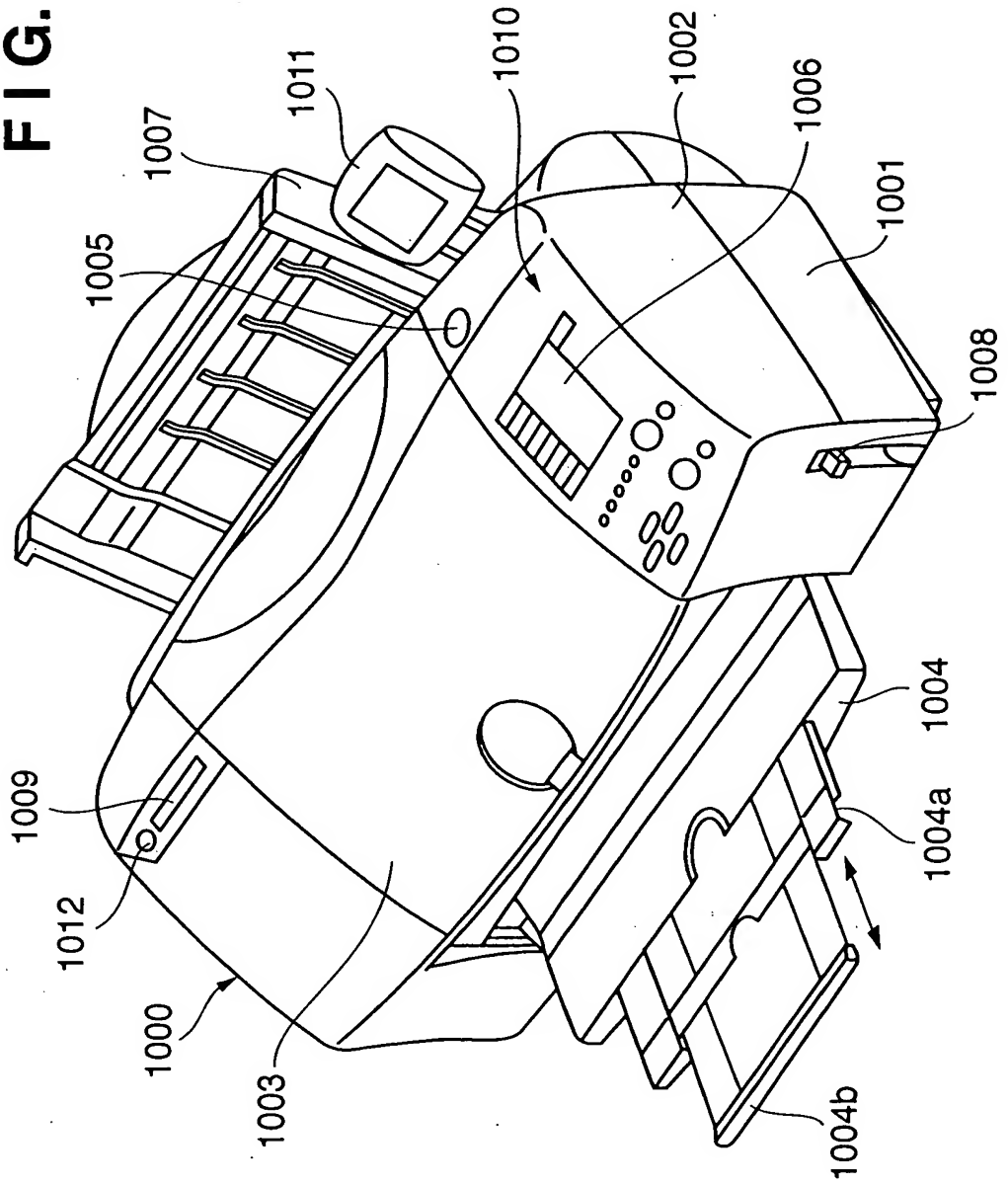

1011
1010
1002
1007
1006
1005
1001
1008
1009
1004
1004a
1012
1000
1003
1004b

FIG. 2

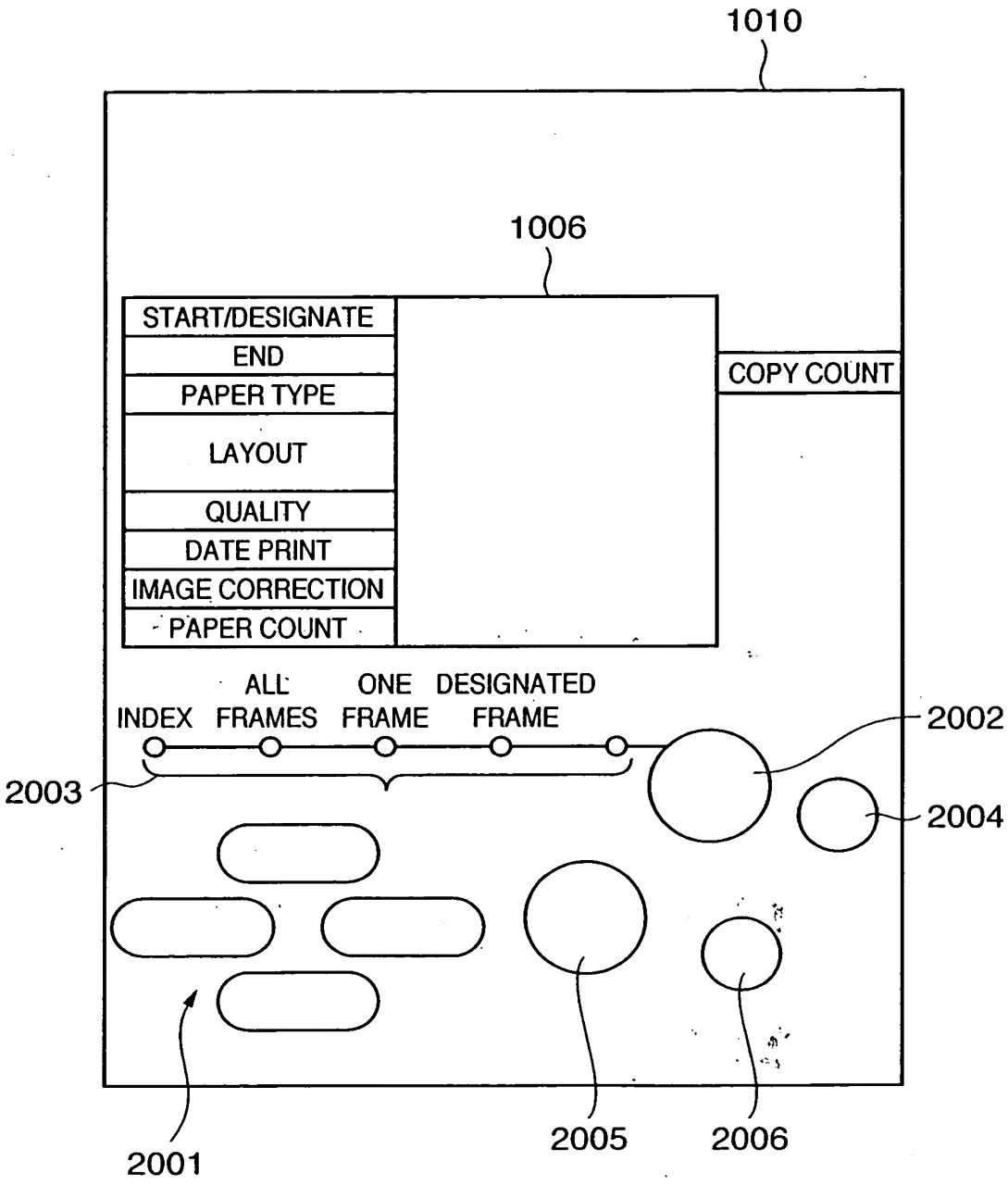

1010
1006
START/DESIGNATE
END
PAPER TYPE
LAYOUT
QUALITY
DATE PRINT
IMAGE CORRECTION
PAPER COUNT
COPY COUNT
INDEX
ALL FRAMES
ONE FRAME
DESIGNATED FRAME
2002
2003
2004
2001
2005
2006

FIG. 3

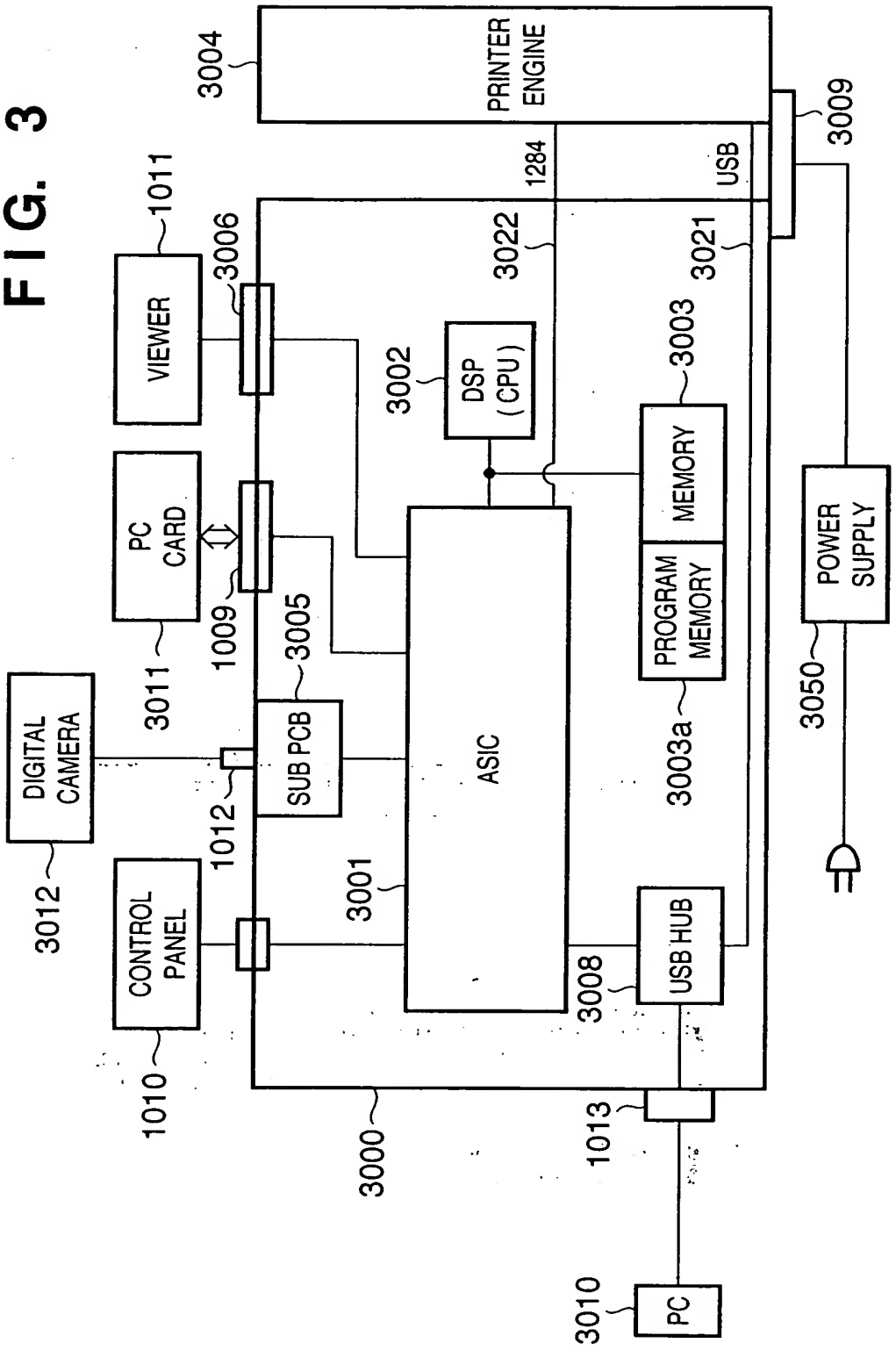

3004
PRINTER ENGINE
1284
USB
3009
1011
VIEWER
3006
3022
3021
3002
DSP (CPU)
3003
MEMORY
PROGRAM MEMORY
3003a
POWER SUPPLY
3050
PC CARD
1009
3005
3011
DIGITAL CAMERA
3012
SUB PCB
1012
ASIC
3001
CONTROL PANEL
1010
3000
3008
USB HUB
1013
3010
PC

FIG. 4

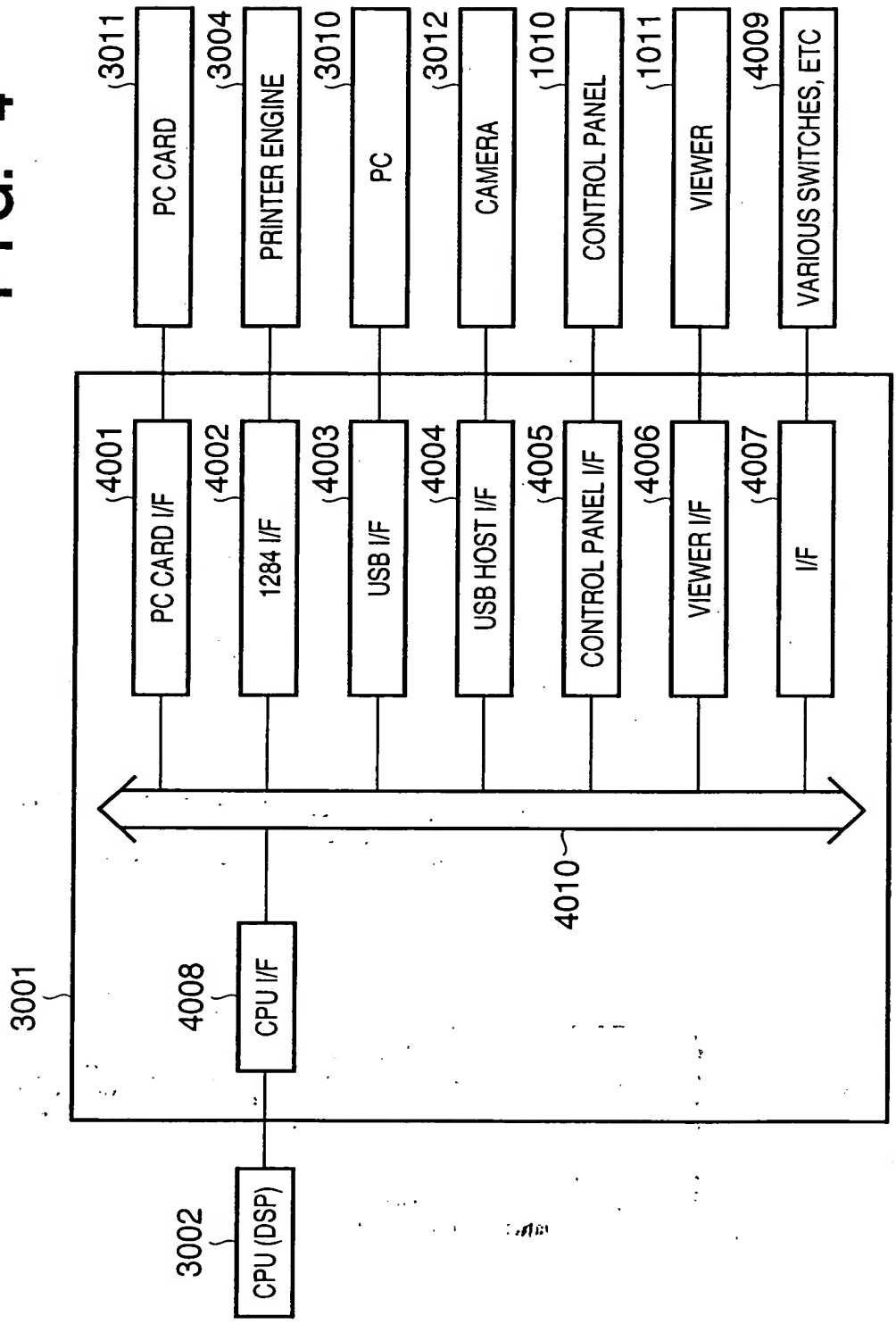

3011
PC CARD
3004
PRINTER ENGINE
3010
PC
3012
CAMERA
1010
CONTROL PANEL
1011
VIEWER
4009
VARIOUS SWITCHES, ETC
4001
PC CARD I/F
4002
1284 I/F
4003
USB I/F
4004
USB HOST I/F
4005
CONTROL PANEL I/F
4006
VIEWER I/F
4007
I/F
4010
3001
4008
CPU I/F
3002
CPU (DSP)

FIG. 5

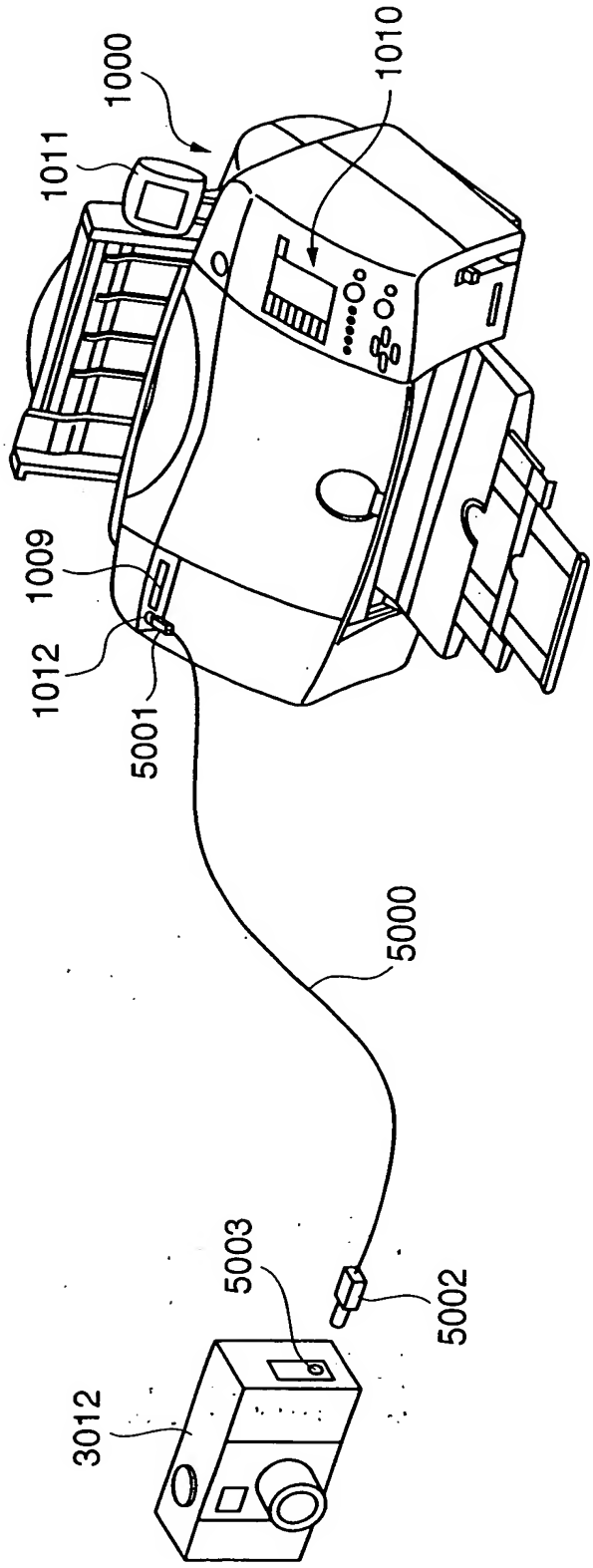


FIG. 6

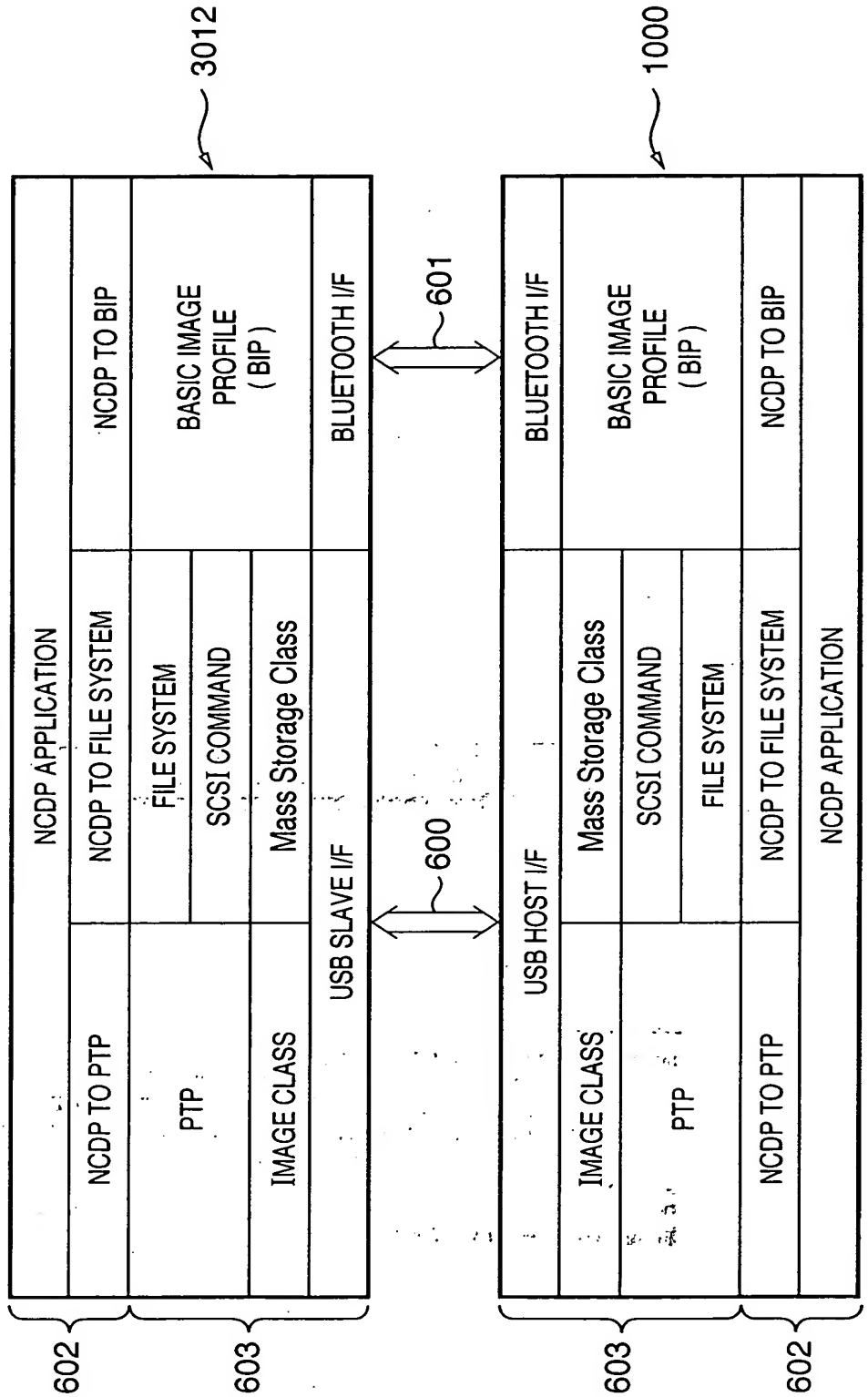

DSC
NCDP APPLICATION
NCDP TO PTP
NCDP TO FILE SYSTEM
NCDP TO BIP
PTP
FILE SYSTEM
SCSI COMMAND
BASIC IMAGE PROFILE (BIP)
IMAGE CLASS
Mass Storage Class
USB SLAVE I/F
BLUETOOTH I/F
3012
600
601
USB HOST I/F
BLUETOOTH I/F
IMAGE CLASS
Mass Storage Class
PTP
SCSI COMMAND
FILE SYSTEM
BASIC IMAGE PROFILE (BIP)
NCDP TO PTP
NCDP TO FILE SYSTEM
NCDP TO BIP
NCDP APPLICATION
1000
PD PRINTER
602
603
603
602

FIG. 7

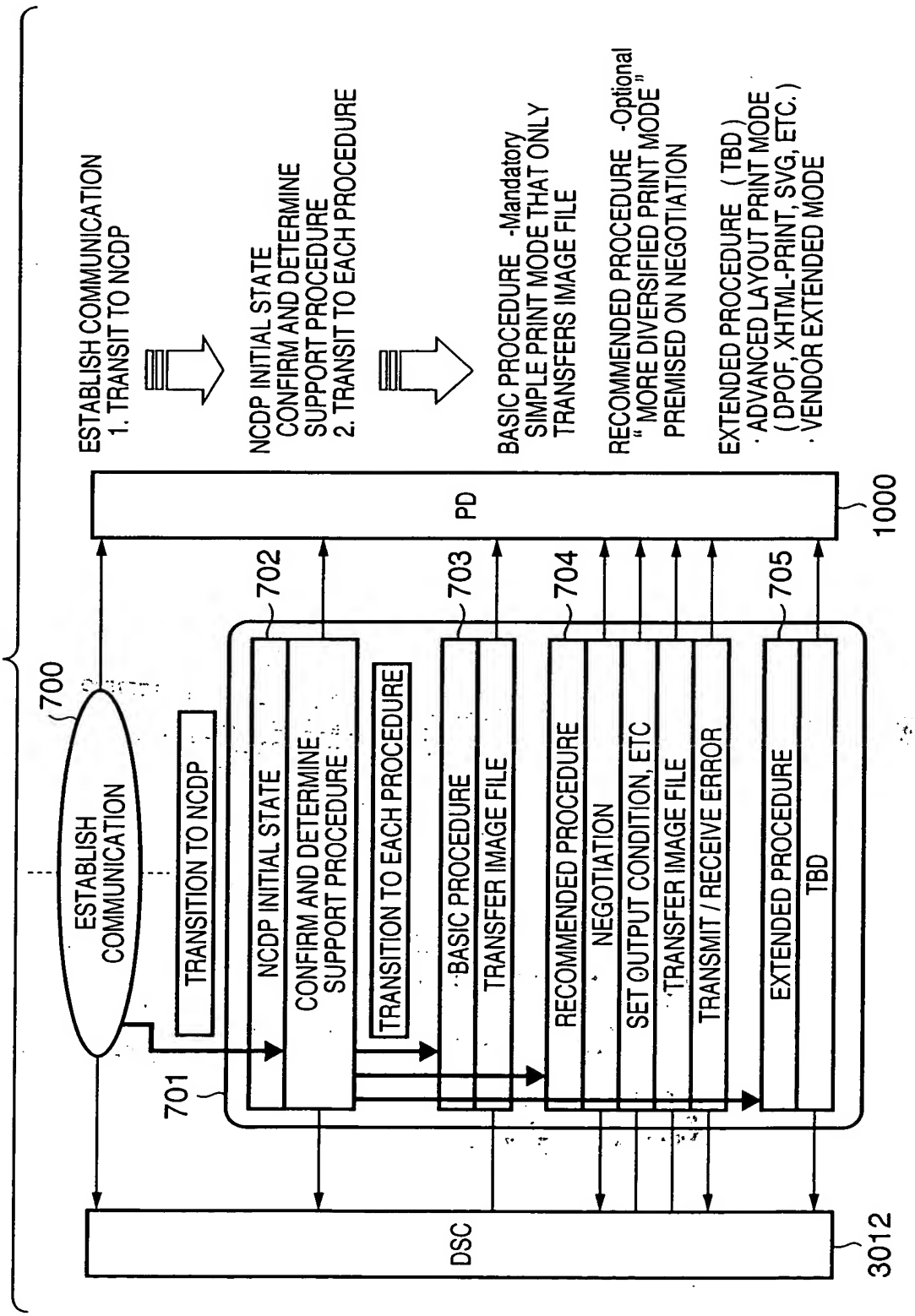

ESTABLISH COMMUNICATION
1. TRANSIT TO NCDP
NCDP INITIAL STATE
CONFIRM AND DETERMINE
SUPPORT PROCEDURE
2. TRANSIT TO EACH PROCEDURE
BASIC PROCEDURE -Mandatory
SIMPLE PRINT MODE THAT ONLY
TRANSFERS IMAGE FILE
RECOMMENDED PROCEDURE -Optional
" MORE DIVERSIFIED PRINT MODE "
PREMISED ON NEGOTIATION
EXTENDED PROCEDURE (TBD)
· ADVANCED LAYOUT PRINT MODE
(DPOF, XHTML-PRINT, SVG, ETC.)
· VENDOR EXTENDED MODE
PD
1000
700
ESTABLISH COMMUNICATION
TRANSITION TO NCDP
701
702
NCDP INITIAL STATE
CONFIRM AND DETERMINE SUPPORT PROCEDURE
TRANSITION TO EACH PROCEDURE
703
· BASIC PROCEDURE
TRANSFER IMAGE FILE
704
RECOMMENDED PROCEDURE
NEGOTIATION
SET OUTPUT CONDITION, ETC
· TRANSFER IMAGE FILE
TRANSMIT / RECEIVE ERROR
705
EXTENDED PROCEDURE
TBD
DSC
3012

FIG. 8

SOURCE	FUNCTION NAME	COMPATIBLE MODE			FUNCTION
		BASIC	RECOMMENDED	EXTENDED	
PRINTER	NCDPStart	○	○	○	TRANSITION TO NCDP
	ProcedureStart	○	○	○	TRANSITION TO EACH MODE (BASIC, RECOMMENDED, EXTENDED)
	NCDPEnd	○	○	○	TERMINATE FROM NCDP
	Capability		○		NOTIFY PRINTER FUNCTION (IF NEGOTIATION IS REQUIRED)
	GetImage	○	○		ACQUIRE IMAGE (JPEG, ETC.) FROM DSC
	StatusSend		○		NOTIFY ERROR STATUS
	PageStart		○		NOTIFY PRINT START (UPON FEEDING SHEET FOR EACH PAGE)
	PageEnd		○		NOTIFY PRINT END (UPON DISCHARGING SHEET FOR EACH PAGE)
	JobEnd		○		NOTIFY END OF PRINT JOB
DSC	JobStart	○	○		PRINT COMMAND
	JobAbort		○		PRINT ABORT COMMAND
	JobContinue		○		PRINT RESTART COMMAND

FIG. 9

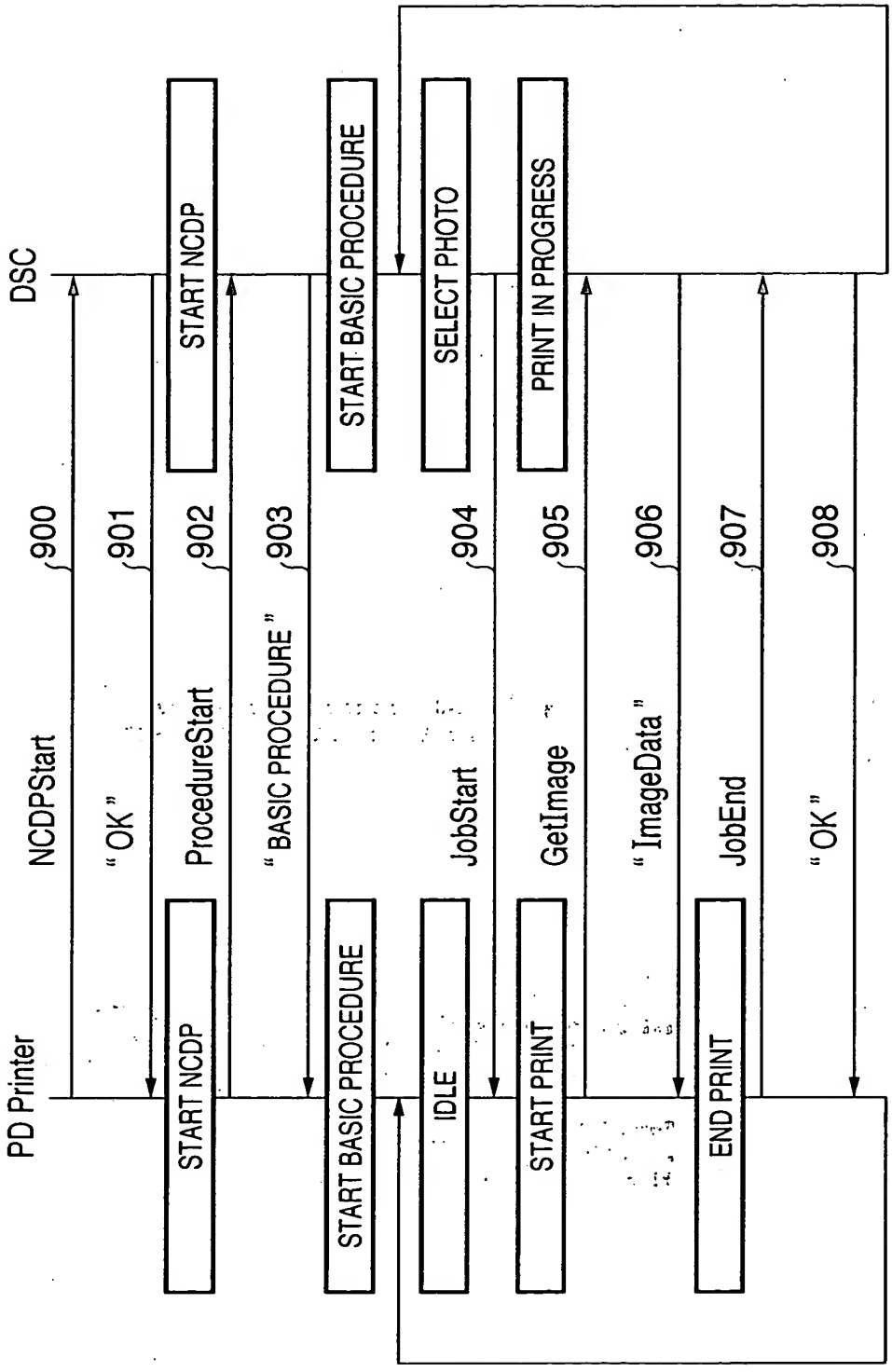

PD Printer
DSC
NCDPStart
"OK"
ProcedureStart
"BASIC PROCEDURE"
JobStart
GetImage
"ImageData"
JobEnd
"OK"
900
901
902
903
904
905
906
907
908
START NCDP
START BASIC PROCEDURE
IDLE
START PRINT
END PRINT
START NCDP
START BASIC PROCEDURE
SELECT PHOTO
PRINT IN PROGRESS

FIG. 10

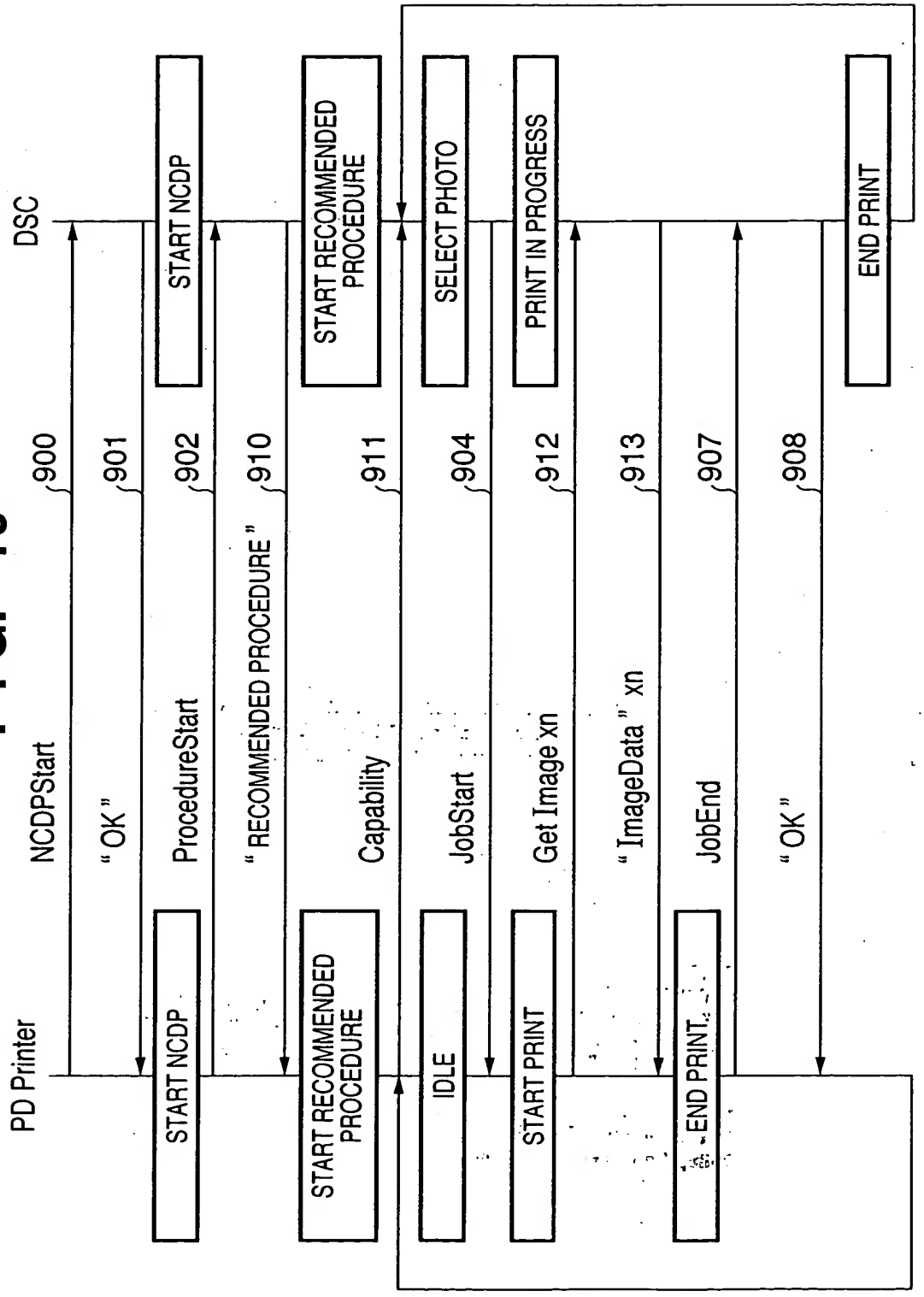

PD Printer
DSC
NCDPStart
900
"OK"
901
START NCDP
ProcedureStart
902
START NCDP
"RECOMMENDED PROCEDURE"
910
START RECOMMENDED PROCEDURE
Capability
911
START RECOMMENDED PROCEDURE
JobStart
904
SELECT PHOTO
IDLE
Get Image xn
912
PRINT IN PROGRESS
START PRINT
"ImageData" xn
913
JobEnd
907
END PRINT
"OK"
908
END PRINT

FIG. 11

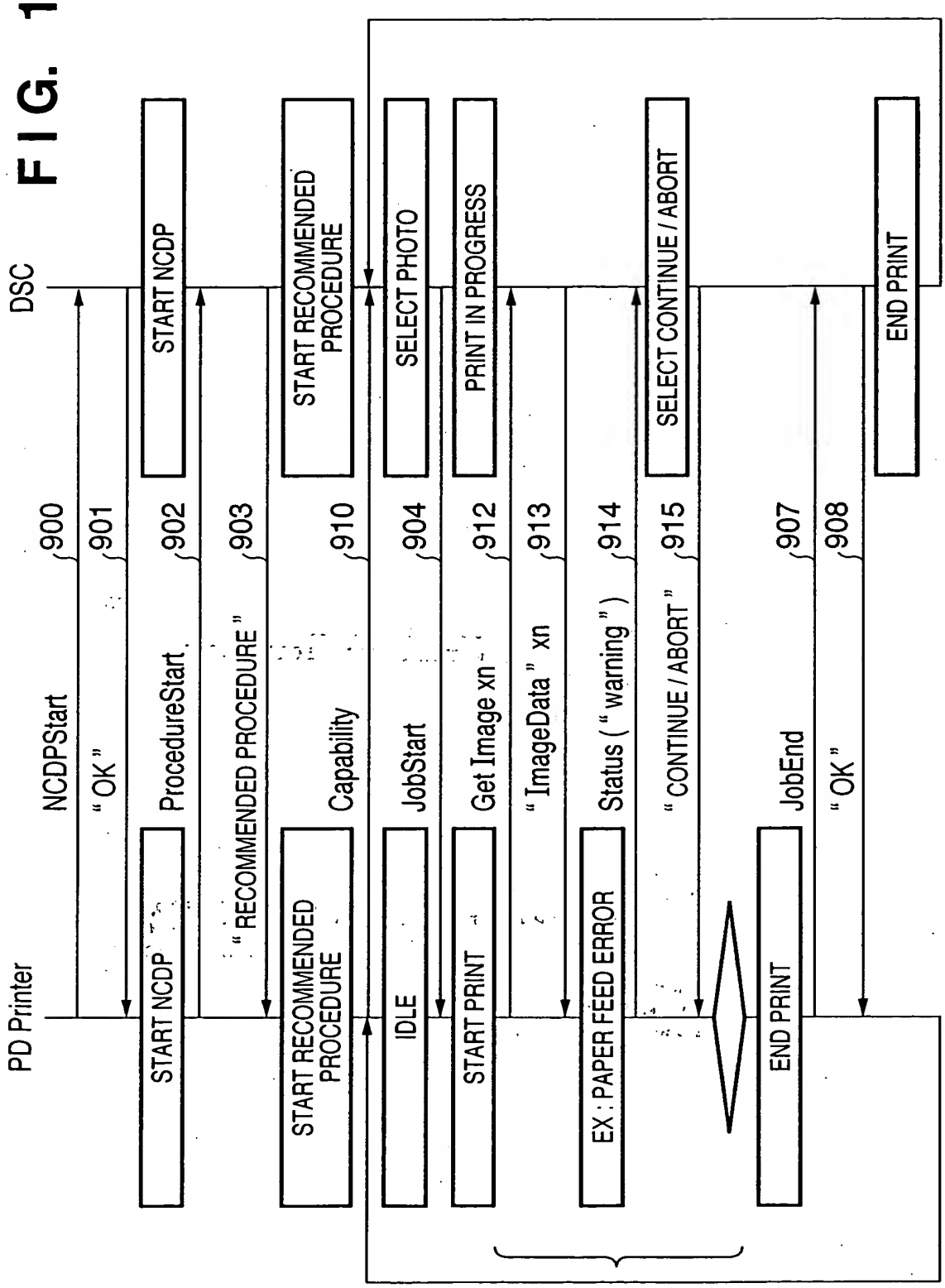

DSC
PD Printer
NCDPStart
"OK"
START NCDP
ProcedureStart
START NCDP
"RECOMMENDED PROCEDURE"
START RECOMMENDED PROCEDURE
Capability
START RECOMMENDED PROCEDURE
JobStart
IDLE
SELECT PHOTO
Get Image xn
START PRINT
PRINT IN PROGRESS
"ImageData" xn
Status ("warning")
EX : PAPER FEED ERROR
"CONTINUE / ABORT"
SELECT CONTINUE / ABORT
JobEnd
END PRINT
"OK"
END PRINT
900
901
902
903
910
904
912
913
914
915
907
908

FIG. 12

<CAPABILITY>	DESCRIBE CONTENTS OF CAPABILITY
ITEMS THAT DO NOT REQUIRE NEGOTIATION	
<Quality=Draft, Normal, Fine>	• OUTPUT QUALITY (QUICK, NORMAL, FINE)
<PaperSize=L, 2L,Card,Wallet, 4×6, A4, Letter, ...>	• DESCRIBE PAPER SIZE
<PaperType=Plain, Photo>	• PAPER TYPE (NORMAL PAPER, PHOTO DEDICATED PAPER)
ITEMS THAT REQUIRE NEGOTIATION	
<ImageType=Tiff, Jpeg, BMP, ...>	• DESCRIBE SUPPORTED IMAGE FORMAT INFORMATION
<Date=On, Off>	• DATE OUTPUT (On, Off)
<FileName = On, Off>	• FILE NAME OUTPUT (On, Off)
<Layout=PAPER SIZE / LAYOUT1, ... ,INDEX(N×M)>	• DESCRIBE OUTPUTTABLE LAYOUT CORRESPONDING TO PAPER SIZE
<Layout=L / Borderless,1×1, 1×2, 2×2, INDEX(3×5)>	
<Layout=2L / Borderless,1×1, 1×2, 2×2, INDEX(5×7)>	
<Layout=Card / Borderless,1×1, 1×2, INDEX(2×3)>	
...	
<Layout=Letter / Borderless,1×1, 1×2, 2×2, 2×4, 4×4, INDEX(8×10)>	
<ImageOptimize=On, Off>	• IMAGE CORRECTION (On, Off)
<SizePerPicture=3MByte>	• OUTPUTTABLE IMAGE SIZE
<Option>	• DESCRIPTION OF OPTION
<Vender=Ganon, HP, SONY, ...>	• VENDOR NAME
<ImageOptimize=DiPS, Auto, On, APP, Vivid, Off, ...>	• VENDOR UNIQUE SPECIFICATION (IMAGE CORRECTION)
<Trimming=(X, Y, W, H)>	• VENDOR UNIQUE SPECIFICATION (TRIMMING)
...	
<Option>	
</CAPABILITY>	

FIG. 13

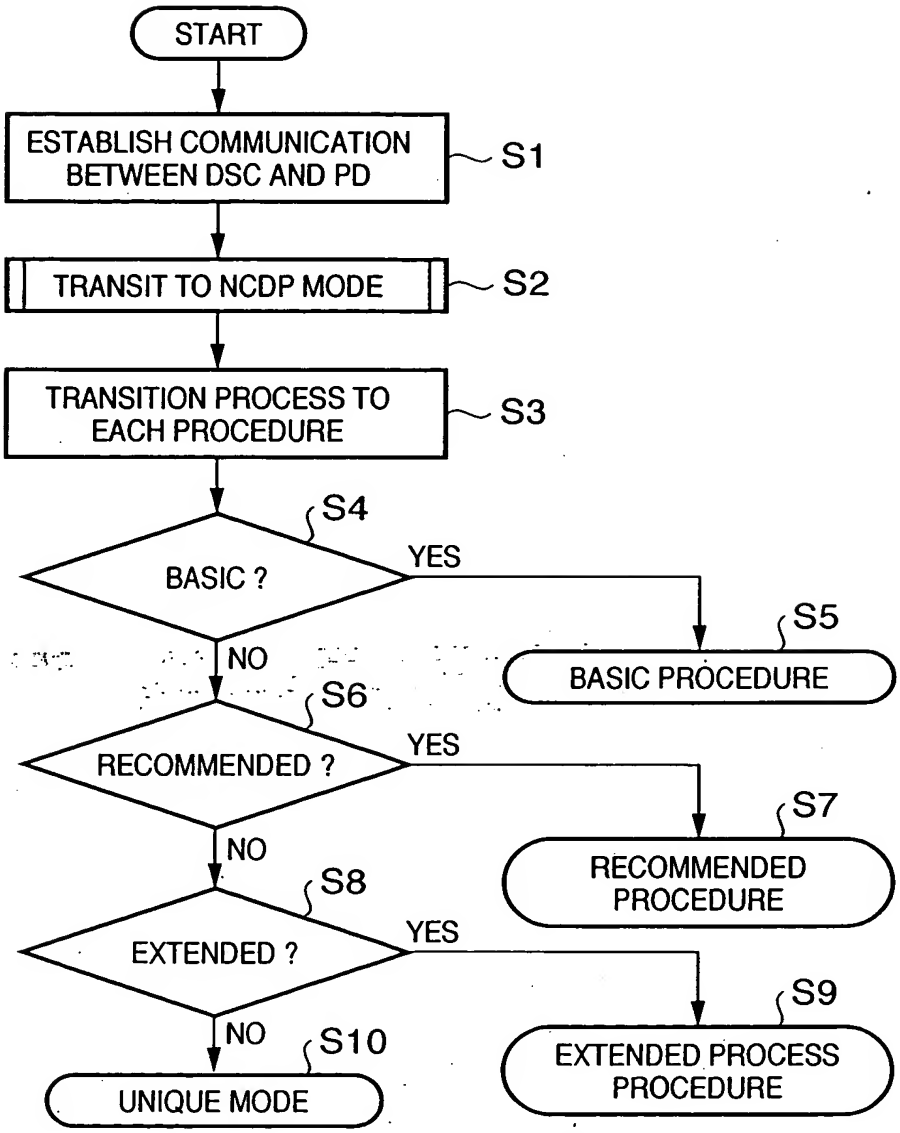

START
ESTABLISH COMMUNICATION BETWEEN DSC AND PD
S1
TRANSIT TO NCDP MODE
S2
TRANSITION PROCESS TO EACH PROCEDURE
S3
S4
BASIC ?
YES
S5
BASIC PROCEDURE
NO
S6
RECOMMENDED ?
YES
S7
RECOMMENDED PROCEDURE
NO
S8
EXTENDED ?
YES
S9
EXTENDED PROCESS PROCEDURE
NO
S10
UNIQUE MODE

FIG. 14

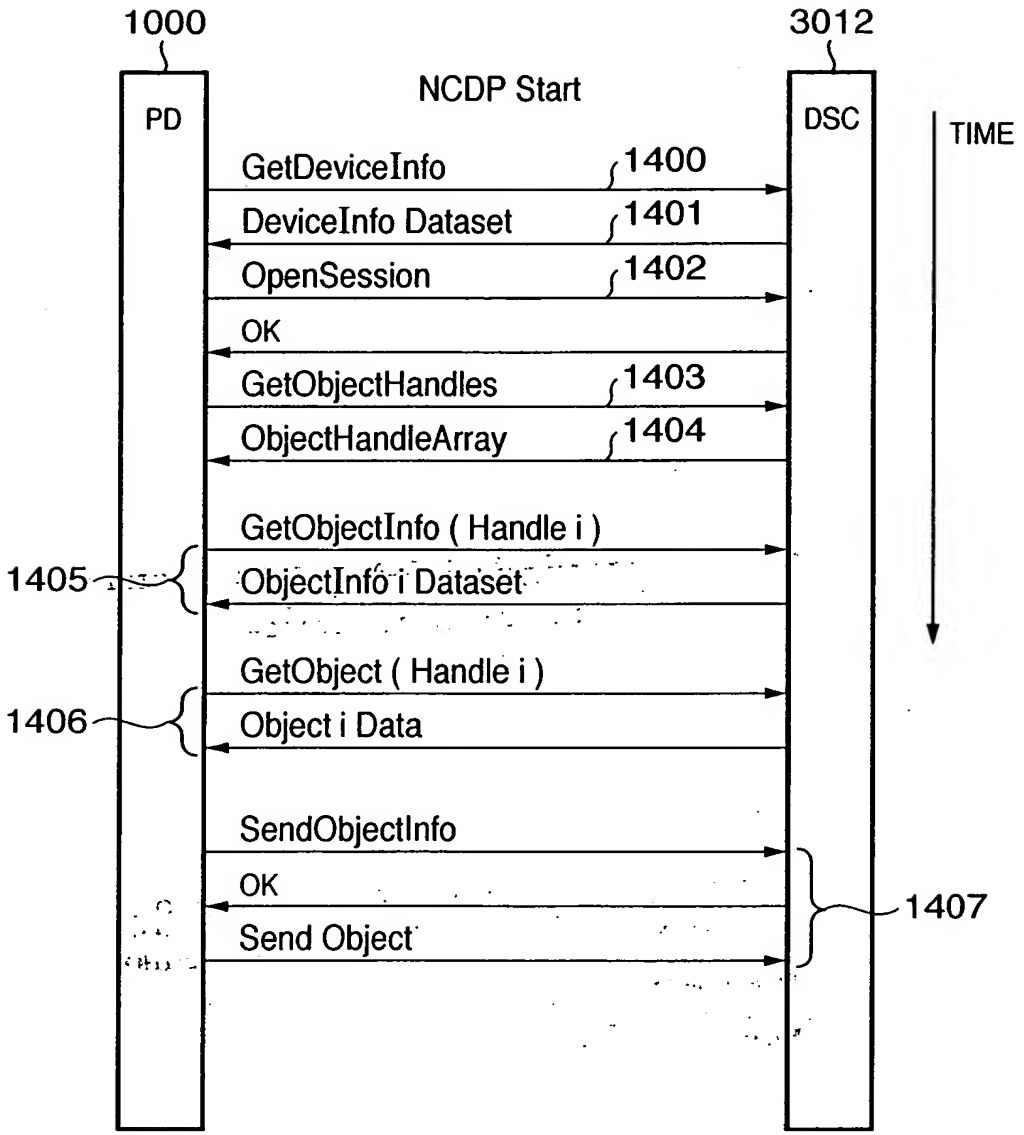

1000
3012
PD
DSC
NCDP Start
TIME
GetDeviceInfo
1400
DeviceInfo Dataset
1401
OpenSession
1402
OK
GetObjectHandles
1403
ObjectHandleArray
1404
GetObjectInfo (Handle i)
1405
ObjectInfo i Dataset
GetObject (Handle i)
1406
Object i Data
SendObjectInfo
OK
Send Object
1407

FIG. 15

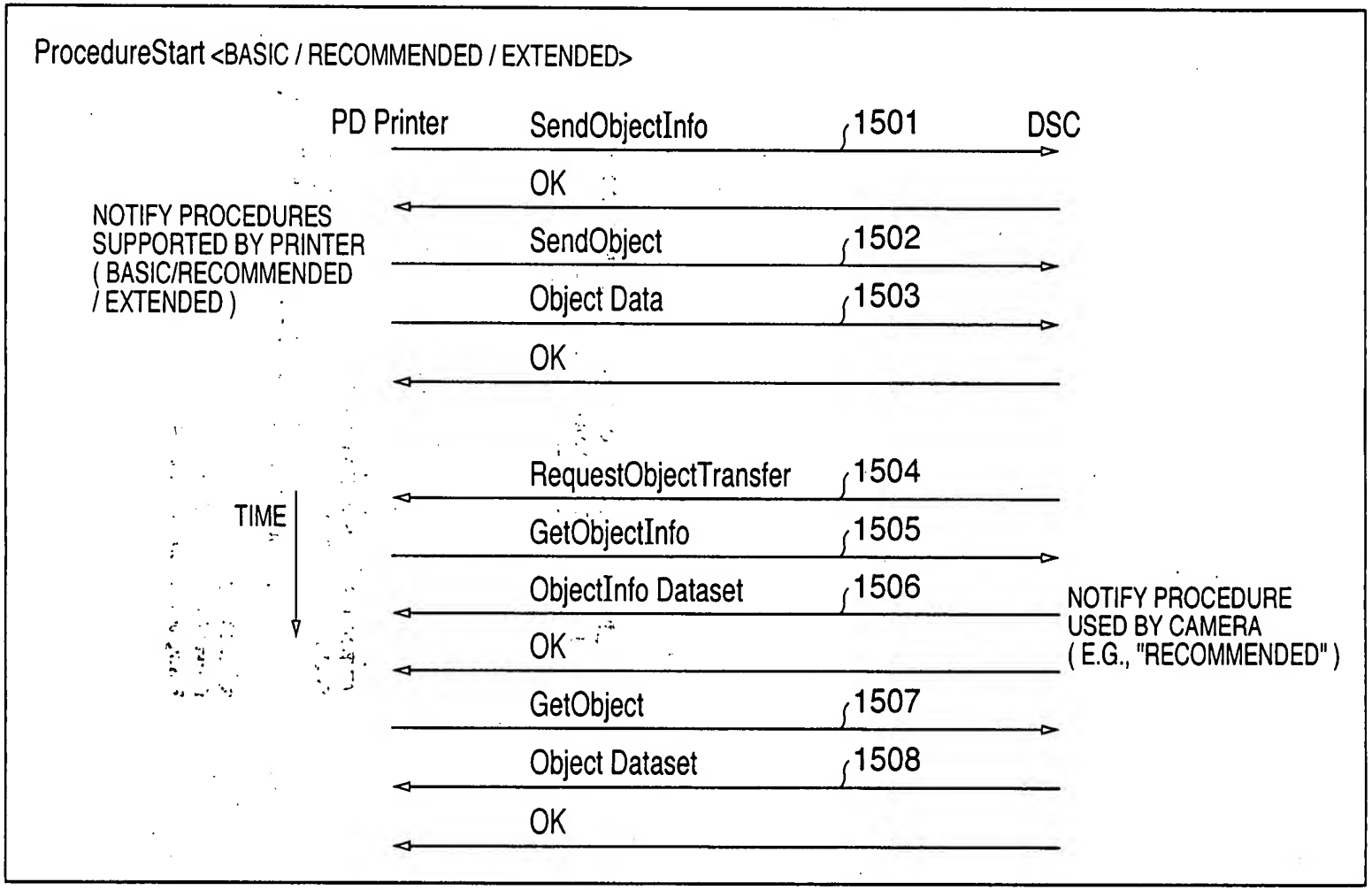

ProcedureStart <BASIC / RECOMMENDED / EXTENDED>
PD Printer
DSC
SendObjectInfo
1501
OK
NOTIFY PROCEDURES SUPPORTED BY PRINTER (BASIC/RECOMMENDED / EXTENDED)
SendObject
1502
Object Data
1503
OK
TIME
RequestObjectTransfer
1504
GetObjectInfo
1505
ObjectInfo Dataset
1506
OK
NOTIFY PROCEDURE USED BY CAMERA (E.G., "RECOMMENDED")
GetObject
1507
Object Dataset
1508
OK

FIG. 16

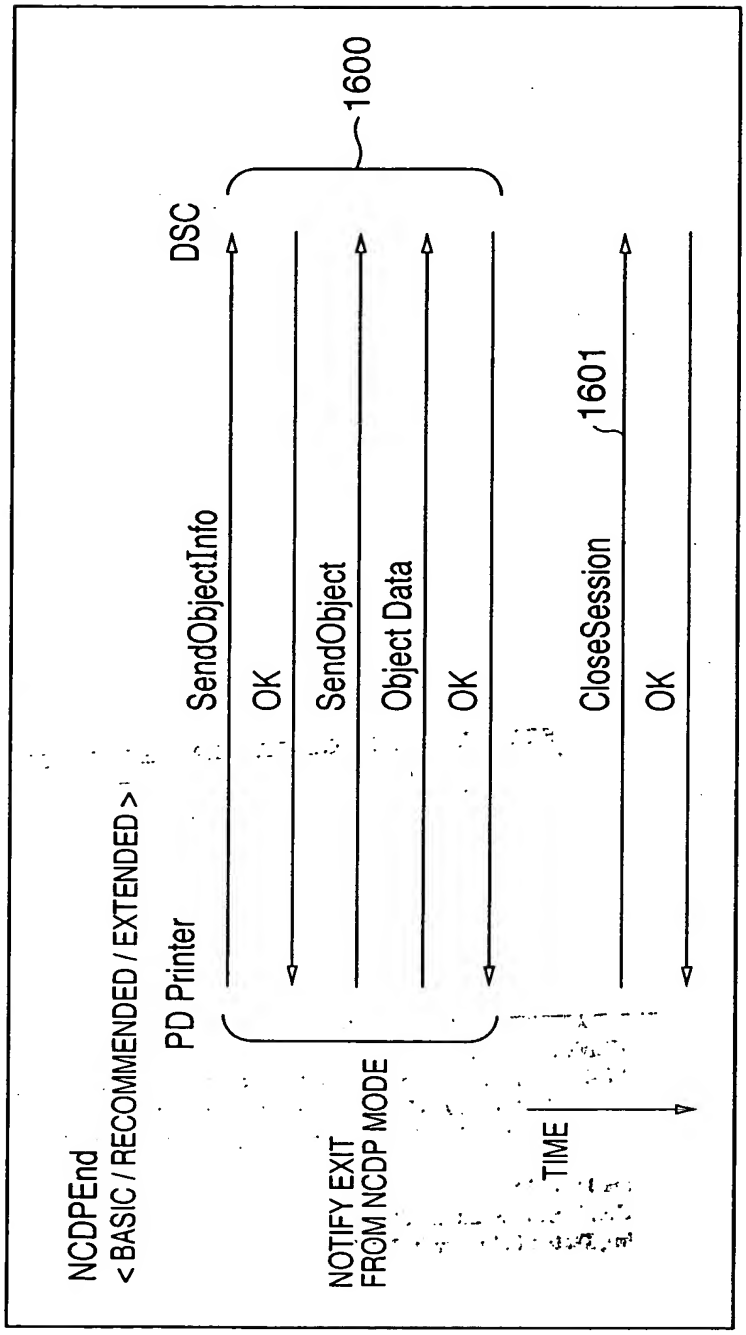

NCDPEnd
< BASIC / RECOMMENDED / EXTENDED >
PD Printer
DSC
1600
SendObjectInfo
OK
SendObject
Object Data
OK
CloseSession
1601
OK
NOTIFY EXIT
FROM NCDP MODE
TIME

FIG. 17

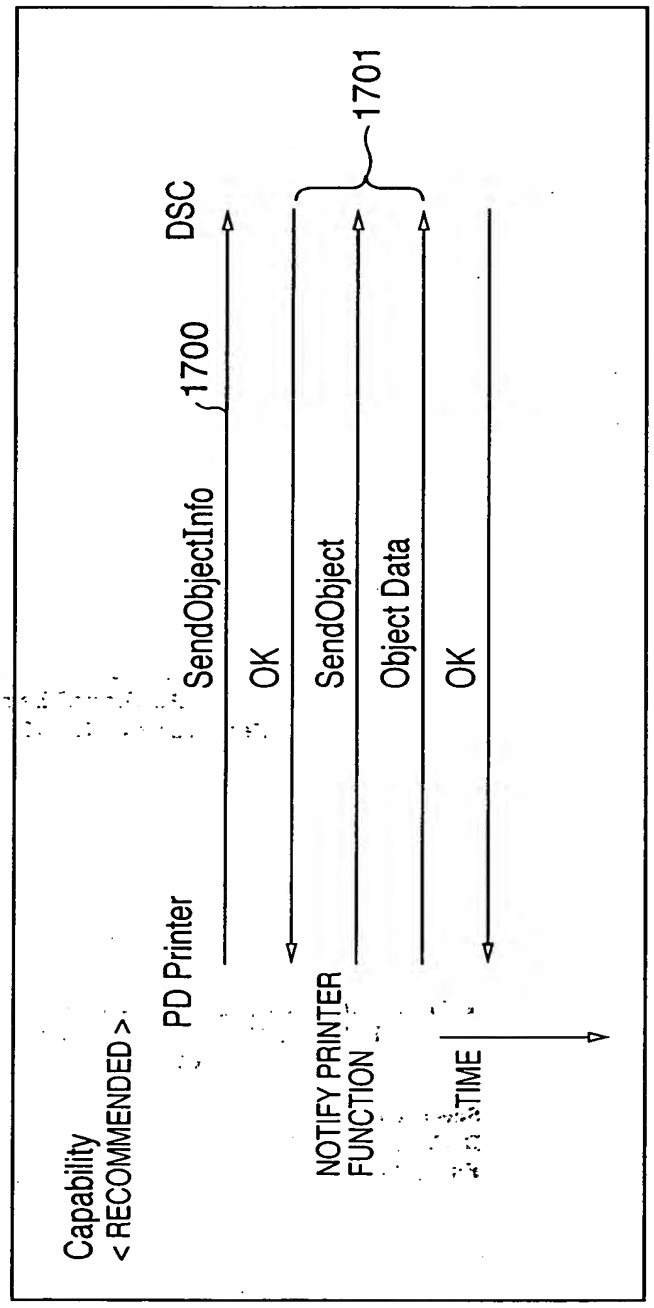

Capability
< RECOMMENDED >
PD Printer
DSC
1700
1701
SendObjectInfo
OK
SendObject
Object Data
OK
NOTIFY PRINTER FUNCTION
TIME

FIG. 18

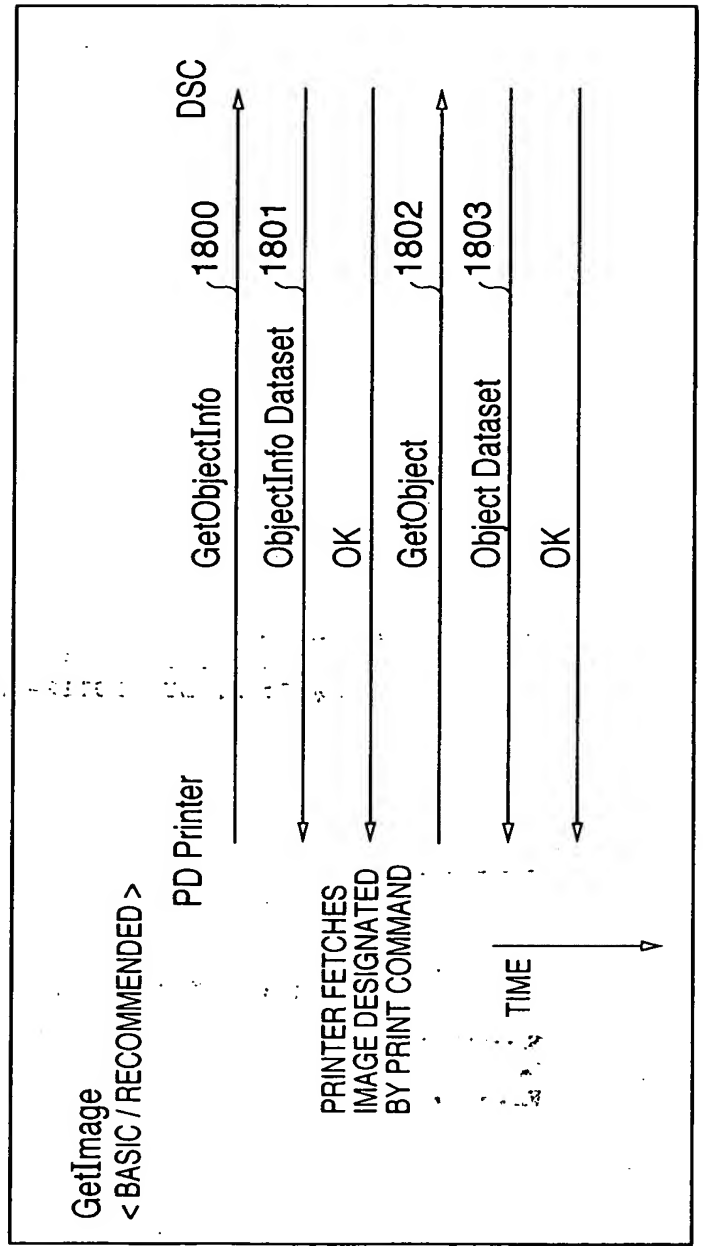

GetImage
< BASIC / RECOMMENDED >
PD Printer
DSC
GetObjectInfo
1800
ObjectInfo Dataset
1801
OK
GetObject
1802
Object Dataset
1803
OK
PRINTER FETCHES IMAGE DESIGNATED BY PRINT COMMAND
TIME

FIG. 19

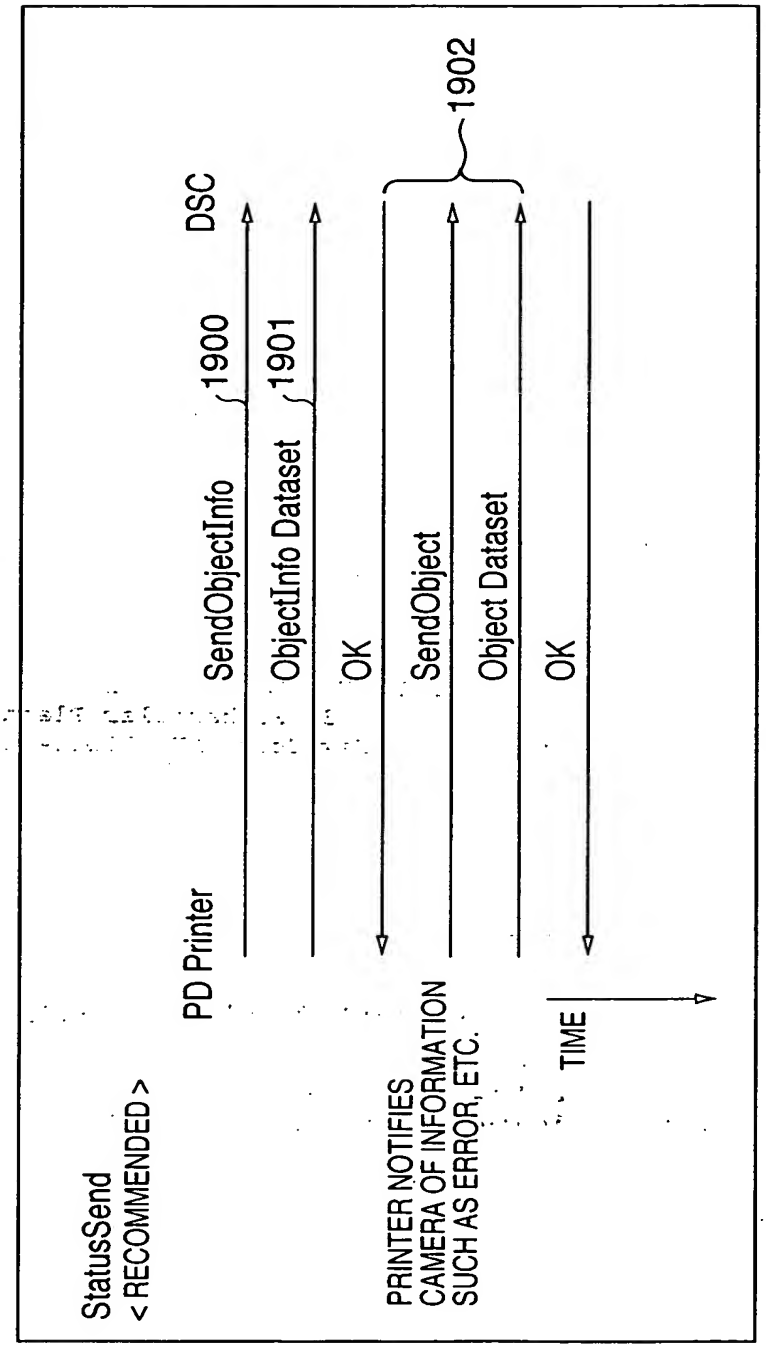

StatusSend
< RECOMMENDED >
PD Printer
DSC
SendObjectInfo
1900
ObjectInfo Dataset
1901
OK
1902
SendObject
Object Dataset
OK
PRINTER NOTIFIES
CAMERA OF INFORMATION
SUCH AS ERROR, ETC.
TIME

FIG. 20

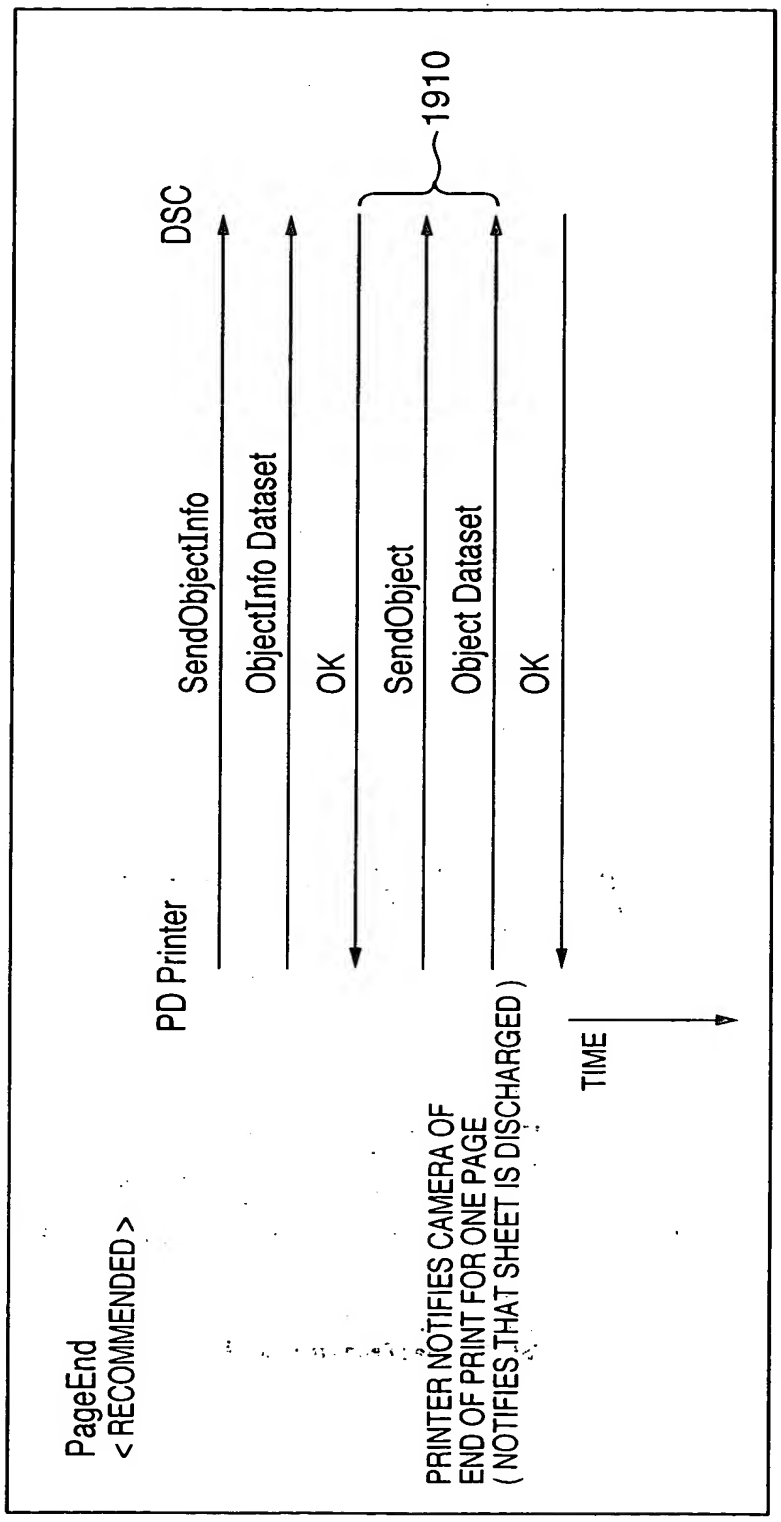

PageEnd
< RECOMMENDED >
PD Printer
DSC
SendObjectInfo
ObjectInfo Dataset
OK
SendObject
Object Dataset
OK
1910
PRINTER NOTIFIES CAMERA OF END OF PRINT FOR ONE PAGE (NOTIFIES THAT SHEET IS DISCHARGED)
TIME

FIG. 21

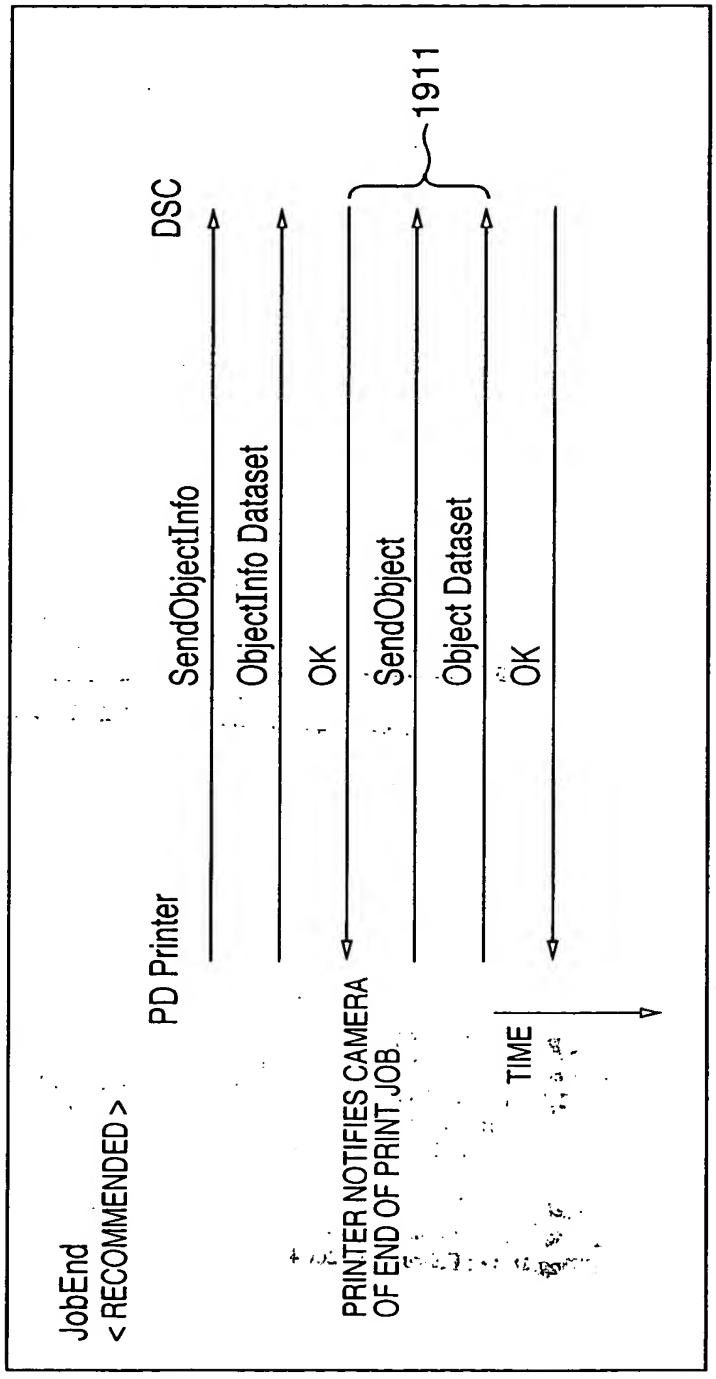

JobEnd
< RECOMMENDED >
PD Printer
DSC
SendObjectInfo
ObjectInfo Dataset
OK
SendObject
Object Dataset
OK
1911
PRINTER NOTIFIES CAMERA
OF END OF PRINT JOB.
TIME

FIG. 22

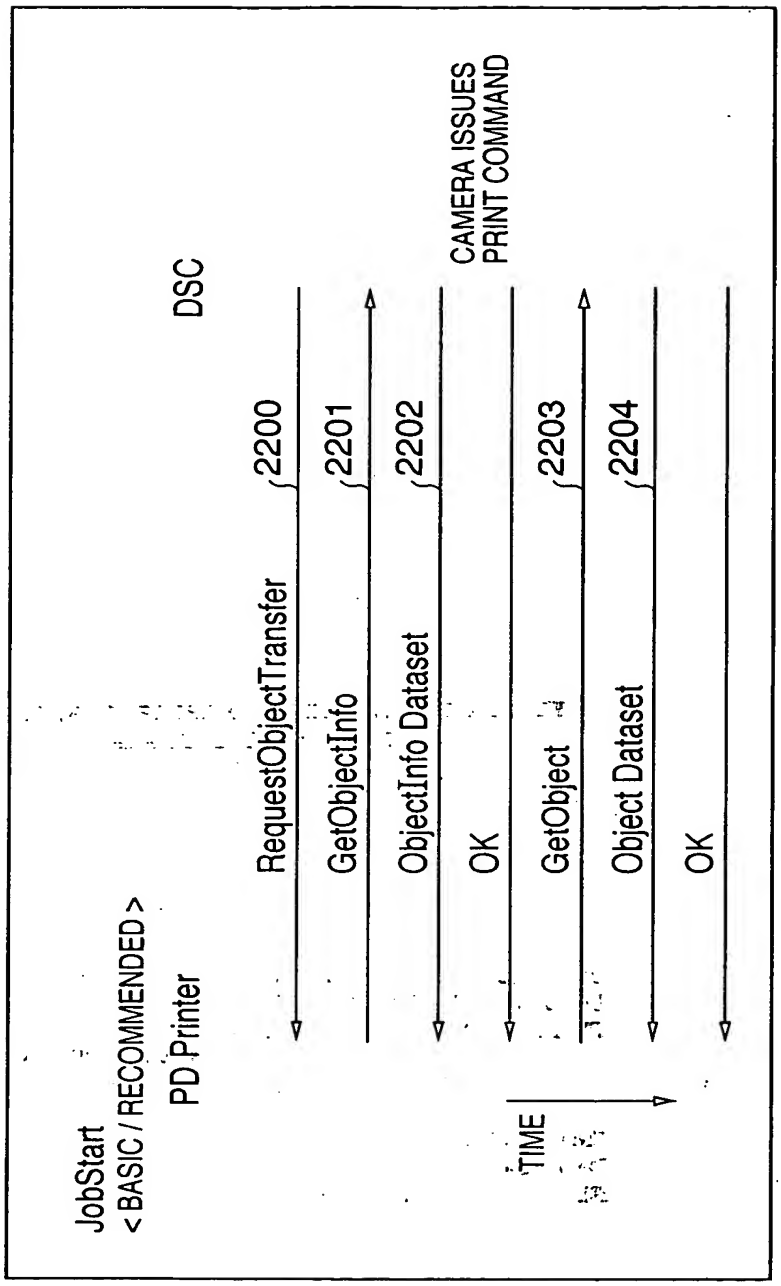

JobStart
< BASIC / RECOMMENDED >
PD Printer
DSC
RequestObjectTransfer
2200
GetObjectInfo
2201
ObjectInfo Dataset
2202
OK
CAMERA ISSUES
PRINT COMMAND
GetObject
2203
Object Dataset
2204
OK
TIME

FIG. 23

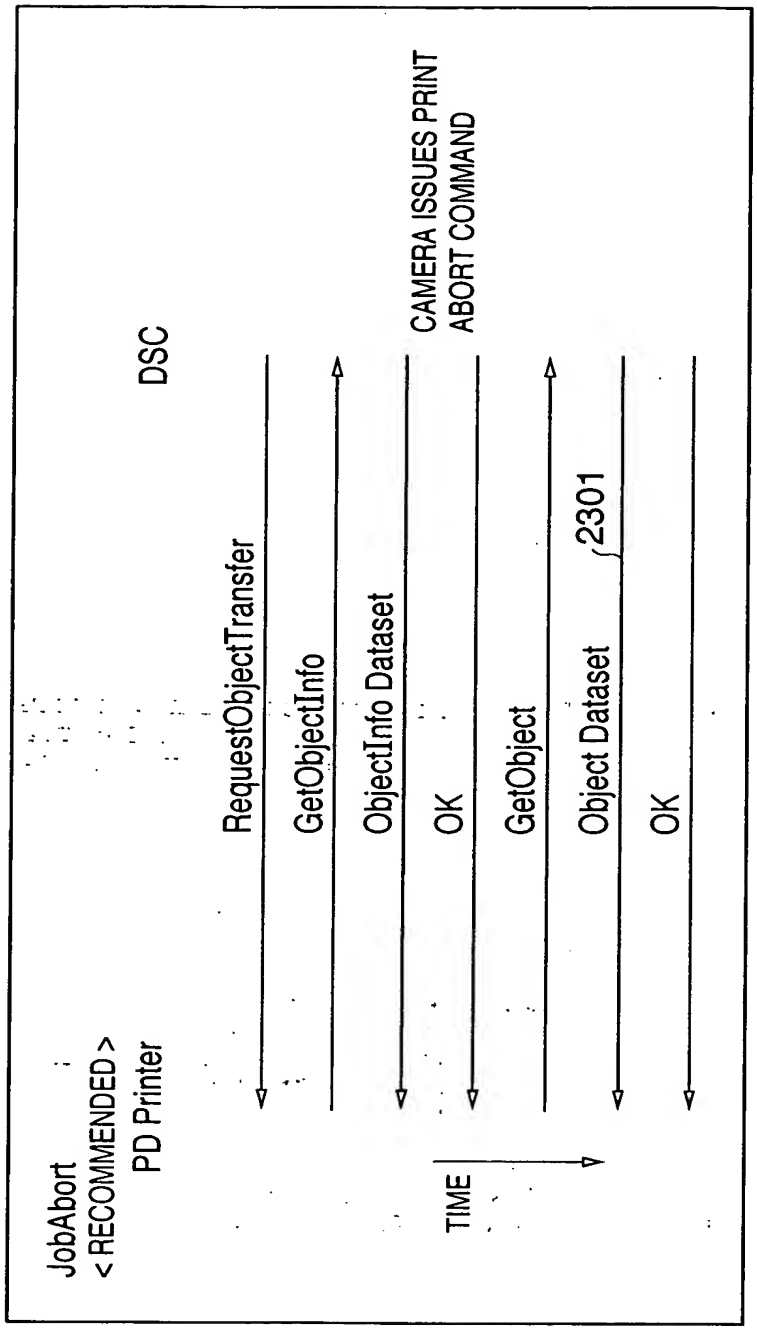

JobAbort
< RECOMMENDED >
PD Printer
DSC
RequestObjectTransfer
GetObjectInfo
ObjectInfo Dataset
CAMERA ISSUES PRINT
ABORT COMMAND
OK
GetObject
Object Dataset
2301
OK
TIME

FIG. 24

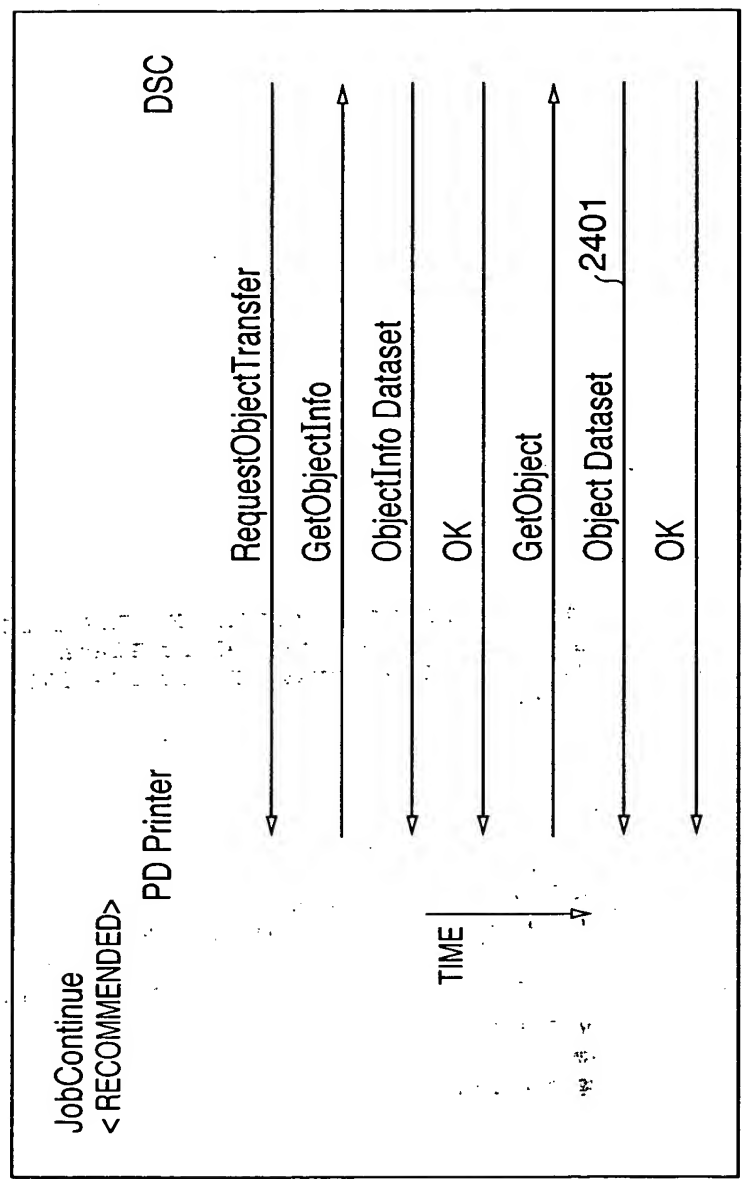

JobContinue
< RECOMMENDED>
PD Printer
DSC
RequestObjectTransfer
GetObjectInfo
ObjectInfo Dataset
OK
GetObject
Object Dataset
2401
OK
TIME

FIG. 25

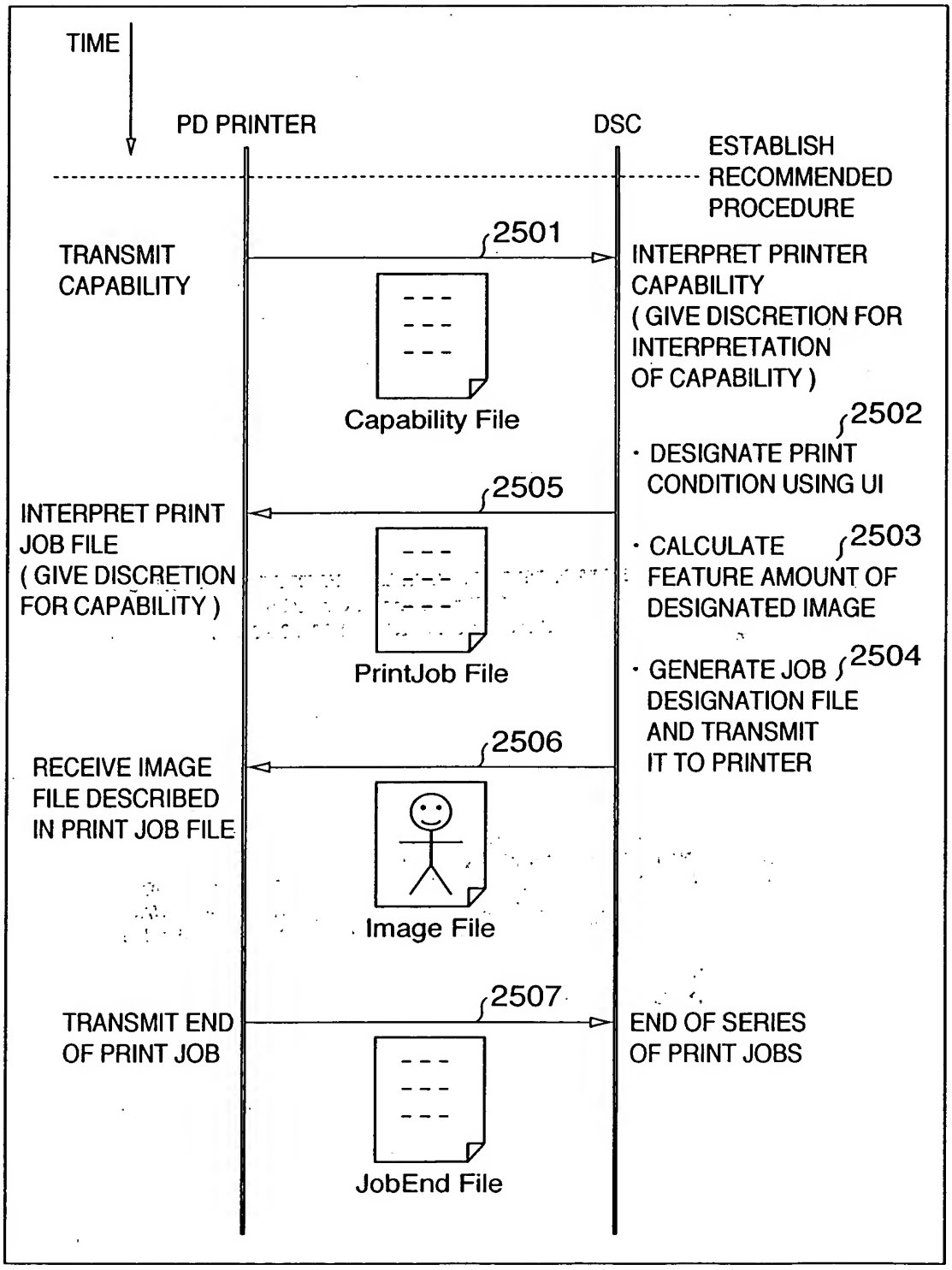

TIME
PD PRINTER
DSC
ESTABLISH RECOMMENDED PROCEDURE
TRANSMIT CAPABILITY
2501
INTERPRET PRINTER CAPABILITY (GIVE DISCRETION FOR INTERPRETATION OF CAPABILITY)
Capability File
2502
· DESIGNATE PRINT CONDITION USING UI
2505
INTERPRET PRINT JOB FILE (GIVE DISCRETION FOR CAPABILITY)
· CALCULATE FEATURE AMOUNT OF DESIGNATED IMAGE
2503
PrintJob File
· GENERATE JOB DESIGNATION FILE AND TRANSMIT IT TO PRINTER
2504
2506
RECEIVE IMAGE FILE DESCRIBED IN PRINT JOB FILE
Image File
2507
TRANSMIT END OF PRINT JOB
END OF SERIES OF PRINT JOBS
JobEnd File

FIG. 26

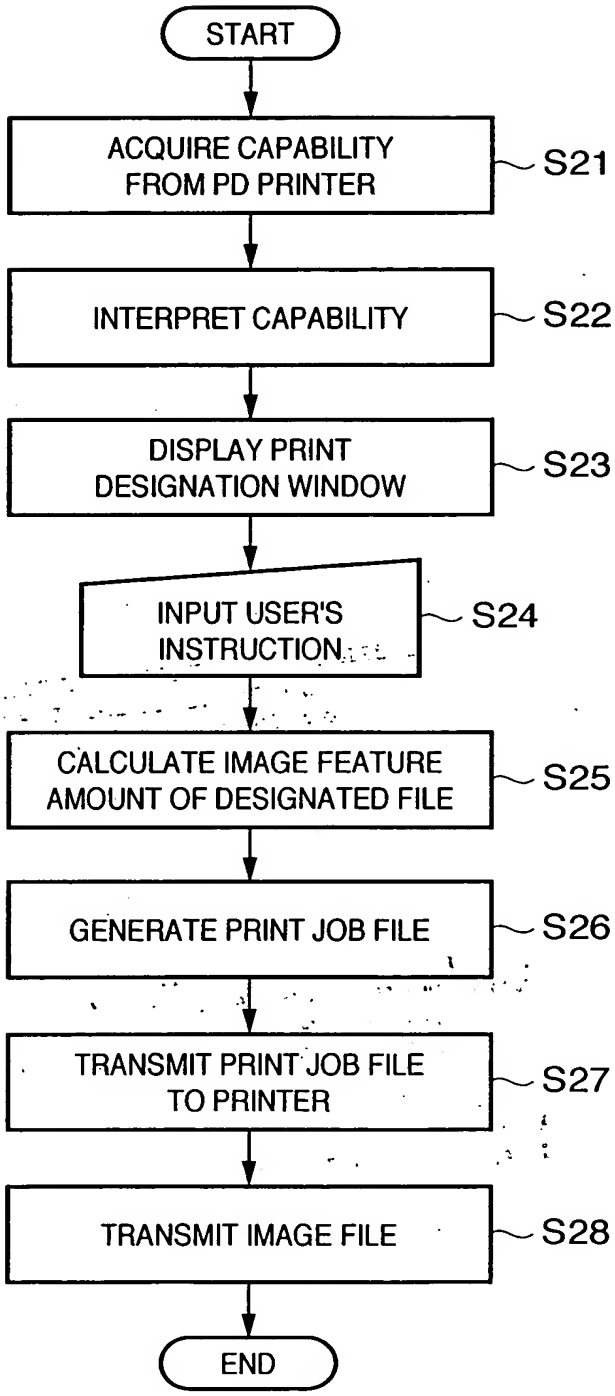

START
ACQUIRE CAPABILITY FROM PD PRINTER
S21
INTERPRET CAPABILITY
S22
DISPLAY PRINT DESIGNATION WINDOW
S23
INPUT USER'S INSTRUCTION
S24
CALCULATE IMAGE FEATURE AMOUNT OF DESIGNATED FILE
S25
GENERATE PRINT JOB FILE
S26
TRANSMIT PRINT JOB FILE TO PRINTER
S27
TRANSMIT IMAGE FILE
S28
END

FIG. 27

```
< ?xml version = "1.0"? >
 < input >
  <  startJob >
   <  jobConfig >
    < imageOptimize > 81FF0108 < /imageOptimize >
   <  /jobConfig >
   <  printInfo >
    < fileID > 0001 < /fileID >
   <  /printInfo >
   <  histogramInfo >
    < fileID > H0001 < /fileID >
   <  /histogramInfo >
  <  /startJob >
 < /input >
< / dps >
```

FIG. 28

```
< ?xml version = "1.0"? >
 < input >
  <  startJob >
   <  jobConfig >
    < imageOptimize > 81FF0108 < /imageOptimize >
   <  /jobConfig >
   <  printInfo >
    < fileID > 0001 < /fileID >
   <  /printInfo >
   <  histogramInfo >
    <  histogramData >
       0100000050806.....
    <  /histogramData >
   <  /histogramInfo >
  <  /startJob >
 < /input >
< / dps >
```

FIG. 29

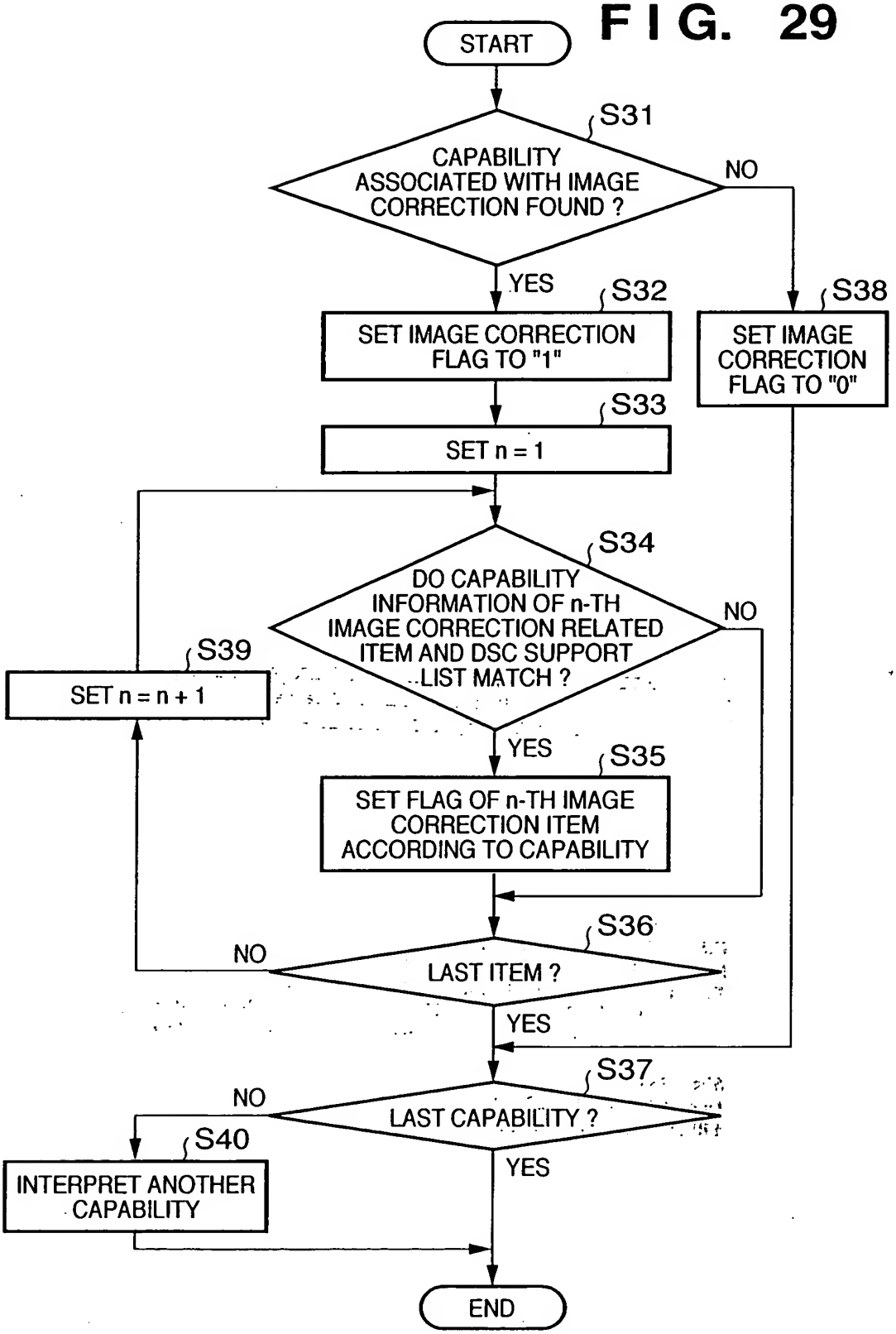

START
S31
CAPABILITY ASSOCIATED WITH IMAGE CORRECTION FOUND ?
NO
YES
S32
SET IMAGE CORRECTION FLAG TO "1"
S38
SET IMAGE CORRECTION FLAG TO "0"
S33
SET n = 1
S34
DO CAPABILITY INFORMATION OF n-TH IMAGE CORRECTION RELATED ITEM AND DSC SUPPORT LIST MATCH ?
NO
S39
SET n = n + 1
YES
S35
SET FLAG OF n-TH IMAGE CORRECTION ITEM ACCORDING TO CAPABILITY
S36
NO
LAST ITEM ?
YES
S37
NO
LAST CAPABILITY ?
S40
INTERPRET ANOTHER CAPABILITY
YES
END

FIG. 30

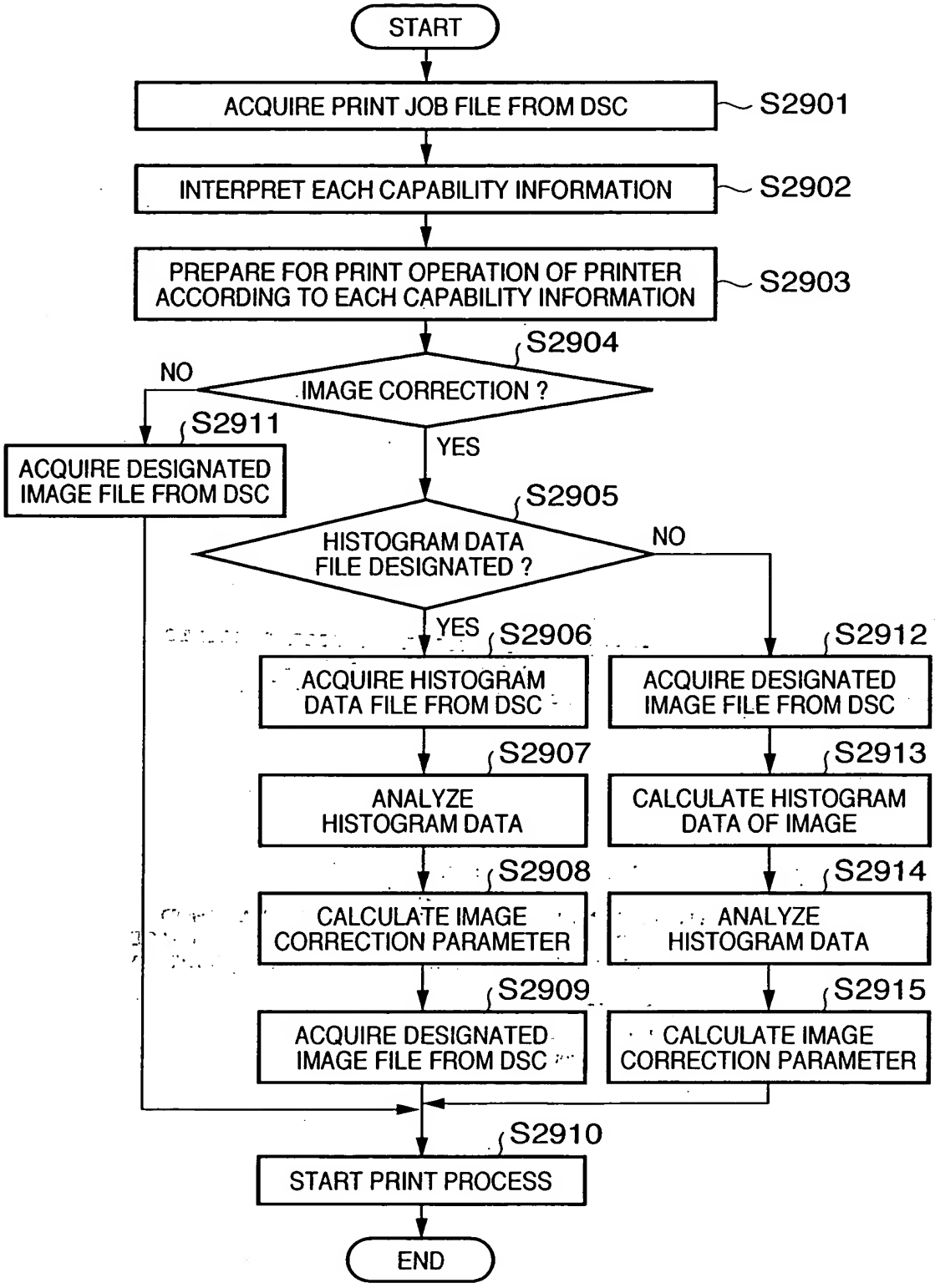
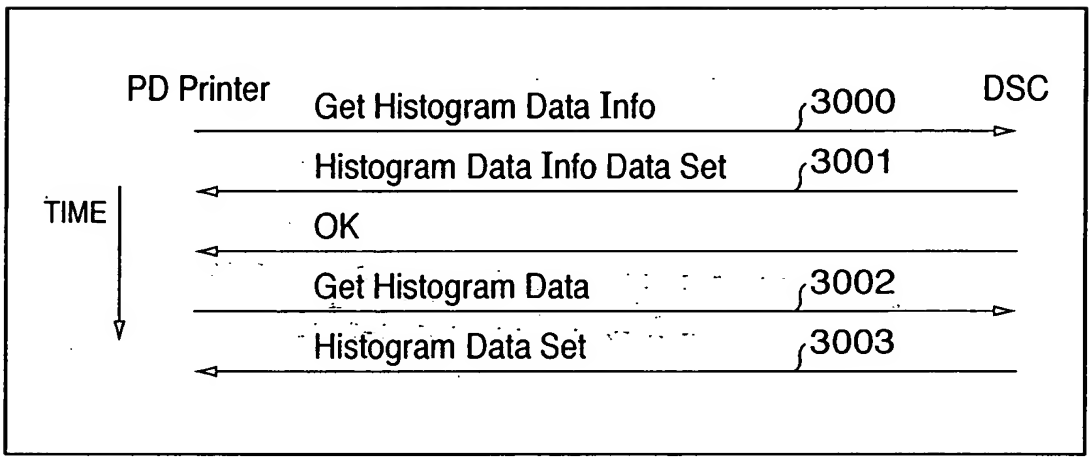

START
ACQUIRE PRINT JOB FILE FROM DSC
S2901
INTERPRET EACH CAPABILITY INFORMATION
S2902
PREPARE FOR PRINT OPERATION OF PRINTER ACCORDING TO EACH CAPABILITY INFORMATION
S2903
S2904
IMAGE CORRECTION ?
NO
YES
S2911
ACQUIRE DESIGNATED IMAGE FILE FROM DSC
S2905
HISTOGRAM DATA FILE DESIGNATED ?
NO
YES
S2906
ACQUIRE HISTOGRAM DATA FILE FROM DSC
S2907
ANALYZE HISTOGRAM DATA
S2908
CALCULATE IMAGE CORRECTION PARAMETER
S2909
ACQUIRE DESIGNATED IMAGE FILE FROM DSC
S2912
ACQUIRE DESIGNATED IMAGE FILE FROM DSC
S2913
CALCULATE HISTOGRAM DATA OF IMAGE
S2914
ANALYZE HISTOGRAM DATA
S2915
CALCULATE IMAGE CORRECTION PARAMETER
S2910
START PRINT PROCESS
END

FIG. 31


PD Printer
DSC
Get Histogram Data Info
3000
Histogram Data Info Data Set
3001
TIME
OK
Get Histogram Data
3002
Histogram Data Set
3003

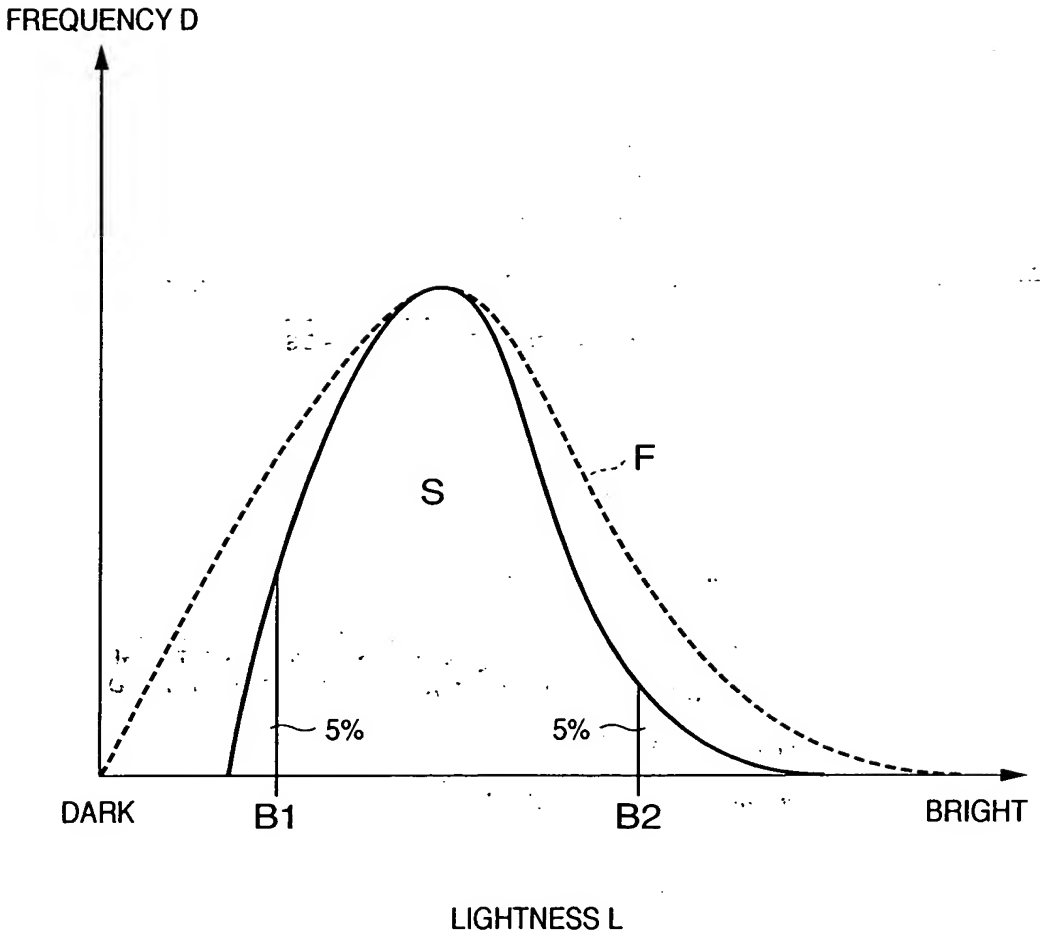



FIG. 32